PRIMARY CARE DIABETES XXX (2015) XXX–XXX

Contents lists available at ScienceDirect

Primary Care Diabetes

journal homepage: http://www.elsevier.com/locate/pcd

Original research

# Care trajectories are associated with quality improvement in the treatment of patients with uncontrolled type 2 diabetes: A registry based cohort study

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ARTICLE INFO

*Article history:*
Received 18 September 2014
Received in revised form
7 January 2015
Accepted 19 January 2015
Available online xxx

*Keywords:*
Type 2 diabetes mellitus
Quality of care
Chronic disease management
Effectiveness
Retrospective cohort study

ABSTRACT

*Aims:* To analyse whether care trajectories (CT) were associated with increased prevalence of parenteral hypoglycemic treatment (PHT = insulin or GLP-1 analogues), statin therapy or RAAS-inhibition. Introduced in 2009 in Belgium, CTs target patients with type 2 diabetes mellitus (T2DM), in need for or with PHT.

*Methods:* Retrospective study based on a registry with 97 general practitioners. The evolution in treatment since 2006 was compared between patients with vs. without a CT, using longitudinal logistic regression.

*Results:* Comparing patients with ($N = 271$) vs. without a CT ($N = 4424$), we noted significant differences ($p < 0.05$) in diabetes duration (10.1 vs. 7.3 years), HbA1c (7.5 vs. 6.9%), LDL-C (85 vs. 98 mg/dl), microvascular complications (26 vs. 16%). Moreover, in 2006, parenteral treatment (OR 52.1), statins (OR 4.1) and RAAS-inhibition (OR 9.6) were significantly more prevalent ($p < 0.001$). Between 2006 and 2011, the prevalence rose in both groups regarding all three treatments, but rose significantly faster ($p < 0.05$) after 2009 in the CT-group.

*Abbreviations:* ACE, angiotensin converting enzyme; ACHIL, Ambulatory Care Health Information Laboratory; ARB, angiotensin receptor blocker; ATC, anatomical therapeutic chemical; BMI, body mass index; BP, blood pressure; CI, confidence interval; CT, care trajectory; DBP, diastolic blood pressure; eGFR, estimated glomerular filtration rate; GLP-1, glucagon-like peptide-1; GP, general practitioner; ICD-10, International Statistical Classification of Diseases and Related Health Problems 10th Revision; ICC, intra class coefficient; ICPC, International Classification of Primary Care; LDL-C, low density lipoprotein cholesterol; MDRD, modification of diet in renal disease; NIHDI, National Institute of Health and Disability Insurance; OAD, oral anti diabetic; OR, odds ratio; RAAS, renin angiotensin aldosteron; RCT, randomized controlled trial; SBP, systolic blood pressure; SMBG, self monitoring of blood glucose; T2DM, Type 2 diabetes mellitus; UK, United Kingdom; WHO, World Health Organization.

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http://dx.doi.org/10.1016/j.pcd.2015.01.008
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Please cite this article in press as: G. Goderis, et al., Care trajectories are associated with quality improvement in the treatment of patients with uncontrolled type 2 diabetes: A registry based cohort study, Prim. Care Diab. (2015), http://dx.doi.org/10.1016/j.pcd.2015.01.008

*Conclusions:* Patients enrolled in a CT differ from other patients even before the start of this initiative with more intense hypoglycemic and cardiovascular treatment. Yet, they presented higher HbA1c-levels and more complications. Enrolment in a CT is associated with additional treatment intensification.
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## 1. Introduction

On the first of September 2009, 'care trajectories' (CT), a disease management program for patients with Type 2 diabetes mellitus (T2DM), were introduced in Belgium on a nationwide scale. As defined by the National Institute of Health and Disability Insurance (NIHDI), a CT is built on a partnership between three parties: the patient, the general practitioner (GP) and the diabetologist. Only those patients receiving a parenteral treatment with insulin or GLP-1 analogues and those patients whose HbA1c target is not achieved with oral glucose lowering treatment and for whom parenteral treatment is taken into consideration could enroll in a CT.

Patients enrolled in a CT benefit from free shared care between a dedicated GP, a dedicated diabetologist, and a diabetes educator. They also receive free Self monitoring of blood glucose (SMBG) material. The GP is responsible for the medical management according to an individualized care plan. The specialist's task is to update the GPs' knowledge and to coach them for individual patients. Patients receive diabetes education at the beginning of the CT and whenever glycaemia is out of control. By the means of the CTs, the Belgian government and its national insurance organization (NIHDI) intend to introduce the principles of chronic care management into a health care system with a long tradition of reactive, loosely organized health care services [1]. According to its official website (http://www.zorgtrajecten.be), the aim of the care trajectories is to:

- Organize, coordinate and plan the treatment and follow-up of patients with diabetes, tailored to their specific situation.
- Encourage the dialogue between patient and GP in order to boost the patient's insight into his illness and in its follow-up by means of a personal care plan.
- Facilitate collaboration between GPs, specialists and other health care personnel.
- Optimize the quality of care.

Attention is spent to a holistic approach of type 2 diabetes including lifestyle habits and evidence based drugs treatment. The focus of the CTs is put on intensifying hypoglycemic therapy but also to optimize and intensify lipid and blood pressure control. In order to facilitate the implementation of this initiative, the NIHDI introduced a new care manager function in primary care, the "Care Trajectory Promoter".

Data on four mandatory parameters – HbA1c, blood pressure, LDL-C and Body Mass Index (BMI) – were collected for all included patients. Those data were analyzed by the 'Ambulatory Care Health Information Laboratory' (ACHIL) [2]. On top of this central datacollection, ACHIL appealed on 3 supplementary data sources in order to give a more comprehensive view on the effectiveness of the CTs. One of them is 'INTEGO' a primary care registry, used as data source for this paper whose characteristics are described hereafter.

The aim of this paper is to examine the effect of enrolment in a CT on treatment intensification, in particular, its effect on parenteral glucose lowering therapy. However, since the CTs want to be holistic, we will also analyze the effect of CT enrolment on statin therapy and on the use of RAAS-inhibitors i.e. either an ACE-inhibitor or an angiotensin receptor blocker (ARB).

## 2. Methodology

### 2.1. Design and data collection

We performed a retrospective cohort study, based on Intego. The full methodology of Intego, a primary care based database with routinely collected data is described elsewhere [3]. For this analysis, data from 95 GPs from 2006 until 2011 were used. The Registering GPs work in 55 practices evenly spread over Flanders, Belgium and prospectively registered all new diagnoses together with new drug prescriptions, laboratory test results and some background information (including gender and year of birth).

Registered data were continuously updated and historically accumulated for each patient. New diagnoses were classified according to a very detailed thesaurus automatically linked to the ICPC-2 (International Classification of Primary Care) and ICD-10 (International Statistical Classification of Diseases and Related Health Problems 10th Revision). Drugs were classified according to the anatomical therapeutic chemical (ATC) classification system. The practice population of Intego covers 1.95% of the Flemish population.

The inclusion criterion for the present study was the presence of the diagnosis of "Type 2 diabetes" in the patient file (ICPC-code T90). Exclusion criteria were an age below 40 years at the reported date of diagnosis of diabetes.

The variables of interest in this study included enrolment in a CT, age (year of birth), age at diagnosis of diabetes, gender, creatinine, HbA1c, systolic and diastolic blood pressure, BMI, LDL-C, micro-albuminuria, hypoglycemic treatment (diet, oral antidiabetic drugs (OAD), insulin or GLP-1 analogues), blood pressure lowering drugs, RAAS-inhibitors, statin therapy and the presence of diabetes associated co-morbidity–defined as a history of stroke and/or ischaemic cardiac disease or peripheral arterial disease and/or neuropathy or retinopathy.

"Parenteral treatment" was defined as either use of insulin or GLP-1 receptor agonists.

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